



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|-----------------|-------------|----------------------|---------------------|------------------|
| 09/715,935 | 11/17/2000 | Xiangxin Bi | 2950.16US02 | 9146 |

7590

11/15/2006

Peter S. Dardi
Patterson, Thunte, Skaar & Christensen, P.A.
4800 IDS Center
80 South 8th Street
Minneapolis, MN 55402-2100

| |
|----------|
| EXAMINER |
|----------|

STOUFFER, KELLY M

| | |
|----------|--------------|
| ART UNIT | PAPER NUMBER |
|----------|--------------|

1762

DATE MAILED: 11/15/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/715,935

Applicant(s)

BI ET AL.

Examiner

Kelly Stouffer

Art Unit

1762

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 10 August 2006.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 18-38 and 62-73 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 71-73 is/are allowed.
- 6) ☒ Claim(s) 18-24, 26-28, 33-38, and 62-70 is/are rejected.
- 7) ☒ Claim(s) 25 and 29-32 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114 was filed in this application after a decision by the Board of Patent Appeals and Interferences, but before the filing of a Notice of Appeal to the Court of Appeals for the Federal Circuit or the commencement of a civil action. Since this application is eligible for continued examination under 37 CFR 1.114 and the fee set forth in 37 CFR 1.17(e) has been timely paid, the appeal has been withdrawn pursuant to 37 CFR 1.114 and prosecution in this application has been reopened pursuant to 37 CFR 1.114. Applicant's submission filed on 10 August 2006 has been entered.

Response to Arguments

2. Applicant's arguments, filed 10 August 2006, with respect to the 35 USC 103(a) rejections of claims 18-26 and 28-32 have been fully considered and are persuasive as the Akedo and Bi patents teach away from coating a substrate comprising fused particles. The 103(a) rejections of claims 18-26 and 28-32 have been withdrawn.

Applicant's arguments, filed 10 August 2006, with respect to the 35 USC 103(a) rejections of claims 33-38 of Börner et al. in view of Bi et al. and Rao et al. and Rao et al. in view of Bernecki have been fully considered and are persuasive. The 103(a) rejections of claims 33-38 of Börner et al. in view of Bi et al. and Rao et al. and Rao et al. in view of Bernecki have been withdrawn.

In addition, applicant's arguments regarding claim 27 and new claims 62-70 and 71-73 have been fully considered and are persuasive.

3. Applicant's arguments filed 10 August 2006 with regard to the remaining 35 USC 103(a) rejections of claims 33-38 have been fully considered but they are not persuasive. The applicant argues that *prima facie* obviousness does not occur with any combination including the Akedo patent because the Akedo patent does not teach coating a substrate through one pass of a substrate relative to an elongated reactant stream. However, in column 3 lines 10-29 of the Akedo patent, Akedo varies the speed of the particles perpendicular to the moving substrate in order to create a layer with good contact with the substrate and little strain in the crystal structure of the film. One of ordinary skill in the art would recognize that by varying the speed of the particles and receiving these results, one is also forming a layer of these particles in a single pass of the beam.

4. New grounds of rejection in the Office Action are as follows:

Claims 18-20, 22-24, 26-28, 62, and 64 are rejected under 35 U.S.C. 102(b) as being anticipated by US Patent number 5043548 to Whitney et al.

Claims 21, 63 and 65-70 are rejected under 35 U.S.C. 103(a) as being unpatentable over Whitney et al. in view of US Patent number 5874134 to Rao et al.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Art Unit: 1762

5. Claims 27, 33-38, and 62-66 rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 27 recites the limitation "the reactant inlet" in line 10. There is insufficient antecedent basis for this limitation in the claim.

Claim 33 recites the limitation "a reactant stream with a cross section perpendicular to the propagation direction characterized by a major axis and a minor axis..." It is unclear whether the major and minor axes refer to the cross section or the propagation direction. Further, the relationship between the major and minor axes is uncertain.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6. Claims 18-20, 22-24, 26-28, 62, and 64 are rejected under 35 U.S.C. 102(b) as being anticipated by US Patent number 5043548 to Whitney et al.

Regarding claim 18, Whitney et al. discloses a method of coating a substrate comprising reacting a reactant stream within a flow (Examples) by directing a radiation beam at the reactant stream to produce within the flow a product stream comprising particles downstream from the radiation beam, or at least the effective area of the

Art Unit: 1762

radiation beam, wherein the particles are produced by a reaction driven by the radiation beam and the flow passes through the radiation beam and is directed towards a substrate (columns 2 and 3 lines 65-16). Whitney et al. also discloses moving the substrate relative to the flow of the product stream (Examples) with a coating comprising fused or melted particles (columns 2 and 3 lines 65-16).

With regard to claims 19 and 20, the radiation source used by Whitney et al. is a laser (abstract).

With regard to claim 22, Whitney et al. shows the reactant stream elongated in a direction along the propagation of the reactant beam in Figure 2

Regarding claims 23, 24 and 26 the substrate may move relative to the product stream (Fig. 2 and Examples) to deposit product particles on the substrate from a reactant stream elongated in a direction along the propagation of the reactant beam or laser.

Regarding claim 27, Whitney et al. also discloses that the reactant inlet or nozzle may move relative to the substrate to sweep particles across the substrate in column 7 lines 41-43.

Regarding claim 28, the conduit or nozzle is shown in Fig. 2 and the reactant inlet or nozzle may move relative to the substrate to sweep particles across the substrate in column 7 lines 41-43.

With regard to claim 62, the radiation source used by Whitney et al. is a laser (abstract).

Art Unit: 1762

With regard to claim 64, Whitney et al. shows the reactant stream elongated in a direction along the propagation of the reactant beam in Figure 2

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

7. Claims 21, 63 and 65-70 are rejected under 35 U.S.C. 103(a) as being unpatentable over Whitney et al. in view of US Patent number 5874134 to Rao et al.

Whitney et al. includes the provisions of claims 65-68 and 70 as discussed above. In addition Whitney et al. shows only depositing a layer on a portion of a substrate in Figure 2 and describes the desirability of only coating portions of the substrate in column 1 et seq. Whitney et al. does not include a substrate that may be temperature controlled with means of heating and cooling the substrate. Rao et al. teaches that the substrate may be temperature controlled by means to heat and cool the substrate in order to prevent grain growth in the deposited layer and to make the deposited layer more dense (column 4 lines 34-67 and column 7 lines 2-10).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Whitney et al. to include a substrate that may be temperature controlled with means of heating and cooling the substrate as taught by Rao et al. in order to prevent grain growth in the deposited layer and to make the deposited layer more dense.

Regarding claims 21, 63 and 69, Whitney et al. includes the provisions of these claims except for pumping on the reaction chamber to maintain flow. Rao et al. describes pumping a on the vacuum chamber, which one of ordinary skill in the art would have recognized as maintaining flow within the chamber, to remove byproducts from the chamber (column 6 lines 50-61).

Art Unit: 1762

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Whitney et al. to include pumping on the reaction chamber to maintain flow as taught by Rao et al. in order to remove byproducts from the reaction chamber.

8. Claims 33-38 are rejected under 35 U.S.C. 103(a) as being unpatentable over Akedo et al. (US 6,280,802 B1) in view of Bi et al. (US 5,958,348) and Rao et al. (US 5,874,134).

Akedo teaches a film forming apparatus that directs a particle stream made up of nanoparticles towards a substrate and moves the substrate relative to the particle stream in order to coat the substrate (column 3, line 10-12). The input of this apparatus is a continuous stream of particles with a size ranging between 10 nanometers to 5 microns (column 2, lines 41-60). In column 3 lines 10-29 of the Akedo patent, Akedo varies the speed of the particles perpendicular to the moving substrate in order to create a layer with good contact with the substrate and little strain in the crystal structure of the film. One of ordinary skill in the art would recognize that by varying the speed of the particles and receiving these results, one is also forming a layer of these particles in a single pass of the beam. Akedo fails to explicitly teach how the particles are produced. However, Bi teaches an apparatus that reacts a reactant stream by directing a focused radiation beam at the reactant stream to produce a product stream comprising particles downstream from the radiation beam, wherein the reaction is driven by energy from the radiation beam (summary). The product stream of this apparatus is a continuous

Art Unit: 1762

stream of nanoparticles. The benefit over the prior art in using this method in order to produce nanosized particles is the efficient use of resources at high production capacity without sacrificing particle quality (column 2, lines 16-24). Therefore, it would have been obvious at the time the invention was made to a person having ordinary skill in the art to have the Bi apparatus provide the nanoparticle input of the Akedo apparatus (reference 23, figures 6 and 9) because producing nanosized particles is an efficient use of resources at high production capacity without sacrificing particle quality. The references collectively fail to explicitly teach performing this in an in-line method.

However, Rao teaches a method of producing nanoparticles by a laser beam and having the product stream be directed to a substrate for coating (figure 1; column 4, lines 25-30). One of ordinary skill would have recognized the benefit of this is the reduction of steps, by not having to collect the particles and transfer them to a separate apparatus. Therefore, it would have been obvious at the time the invention was made to a person having ordinary skill in the art to perform the process of Akedo in view of Bi in an in-line fashion (having the product stream of Bi be directed to the input of the Akedo reference). The motivation to do so would be the reduction of steps. By doing so, one would reap the benefits of the efficient use of resources at high production capacity without sacrificing particle quality. The method that results meets the applicant's claims, as has been discussed in previous Office Actions.

Art Unit: 1762

9. Claims 33-38 are rejected under 35 U.S.C. 103(a) as being unpatentable over Akedo et al. (US 6,280,802 B1) in view of Kambe et al. (WO 99/23189) and Rao et al. (US 5,874,134).

Akedo teaches the limitations as shown above, specifically to deposit nanoparticles of oxides onto a substrate, but fails to explicitly teach using the process of Kambe as the input of the method. However, Kambe teaches the production of silicon oxide particles by a process shown above. To use the process of Kambe to provide the input of Akedo would have been obvious as the process of Kambe provide a high level of purity (page 1, lines 30-35) and efficiency (page 2, lines 1-5). The combined references fail to teach performing the process in-line.

However, Rao teaches a method of producing nanoparticles by a laser beam and having the product stream be directed to a substrate for coating (figure 1; column 4, lines 25-30). One of ordinary skill would recognize the benefit of this is the reduction of steps, by not having to collect the particles and transfer them to a separate apparatus. Therefore, it would have been obvious at the time the invention was made to a person having ordinary skill in the art to perform the process of Akedo in view of Kambe in an in-line fashion (having the product stream of Kambe be directed to the input of the Akedo reference). The motivation to do so would be the reduction of steps. By doing so, one would reap the benefits a high level of purity and efficiency. The method that results meets the applicant's claims.

Allowable Subject Matter

10. Claims 25 and 29-32 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. Whitney et al. or Rao et al. alone or in combination do not provide for coating more than one substrate, or creating a glass coating by heating the substrate.

11. Claims 71-73 are allowed. The prior art used in this Office Action, alone or in combination, does not support coating more than one layer by the disclosed methods in the manner claimed in claim 71.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kelly Stouffer whose telephone number is (571) 272-2668. The examiner can normally be reached on Monday - Thursday 7:00-5:30.


If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Timothy Meeks can be reached on (571) 272-1423. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 1762

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Kelly Stouffer
Examiner
Art Unit 1762

kms


FRED J. PARKER
PRIMARY EXAMINER